

## Ph.D. proposal

# Nonlinear vibroacoustic response of finite-size porous and micro-perforated plates

### Keywords

Vibration, vibroacoustic, acoustic, porous plate, micro-perforated structure, nonlinear vibration, high sound pressure level, mechanical damping, sound absorption, sound radiation.

### Description

Metallic open-cell porous plates and micro-perforated plates are lightweight structures, which can be used in harsh environments, such as aircraft engines where high sound pressure levels and high amplitude vibrations are expected. Such structures involve viscous and thermal material mechanisms, which translate into mechanical damping and sound absorption properties. Previous studies on the vibrations in the linear regime of thin poroelastic plates have shown that the fluid solid interaction can induce a substantial additional damping. However, vibroacoustic indicators (MSV, radiated sound power, efficiency) for porous or perforated plates should be further investigated. Moreover, it is known from experimental investigations that the vibroacoustic response of the above systems is very sensitive to the magnitude of external excitations. Accordingly, it is proposed to explore analytical, semi-empirical and numerical avenues to extend the current model to a nonlinear framework. An attendant experimental program will bring physical insight, characterize and validate the implemented models.

The project will be articulated in three parts:

- Nonlinear vibroacoustic response of finite-size porous plates under high sound pressure level,
- Nonlinear vibroacoustic response of finite-size porous plates under strong levels of displacement,
- Application for Nonlinear vibroacoustic to micro-perforated structures.

This project corresponds to a collaboration between ÉTS (Montreal, Canada), McGill University (Montreal, Canada) and Université de Bourgogne (Nevers, France). Various trips to the collaborative laboratories will be scheduled. The interested applicant is expected to show good skills in the areas of structural vibration, acoustics and vibroacoustics.

### Main Laboratory

GRAM-ICAR-ÉTS

### Contact

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### Links

<http://gram.etsmtl.ca/fr/about-us/>

<http://icar.etsmtl.ca/>

<http://structdynvibrablab.mcgill.ca/>

<http://www.isat.fr/recherche/equipe-mat.html#vibrations-et-acoustique-des-transports>